# AMSAT SATELLITE REPORT

**Volume 1 Number 12**
**July 27, 1981**

**Editor:** Vern Riportella, WA2LQQ
**Contr. Editor:** Bob Nickels, KEØT
**Managing Editor:** Bob Myers, W1XT


## UoSAT on Target for Mid-Sep Date

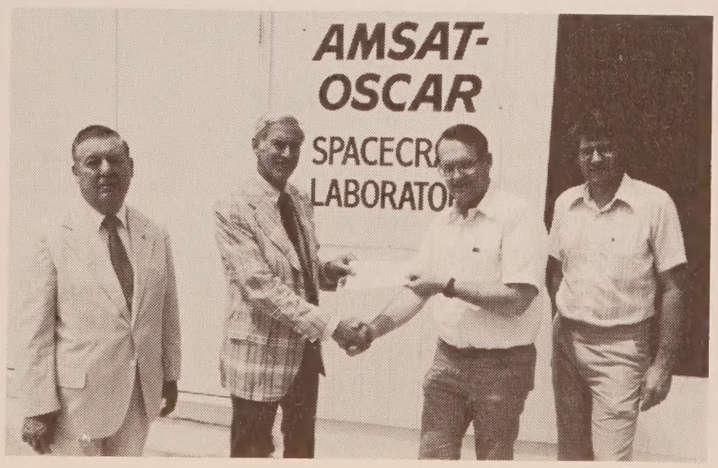
The University of Surrey (England) Amateur Scientific Satellite, UoSAT, is nearing completion and Program Manager Martin Sweeting, G3YJO, is quoted as believing that the remaining outstanding items should be resolved and completed in time for a 15 September 81 launch. UoSAT will be launched from Vandenberg AFB, California as the secondary payload aboard a NASA Delta 2310 launcher. The primary payload is the NASA Solar Mesospheric Explorer (SME). UoSAT is expected to have a four to five year operational life in its low polar orbit having an apogee of 530 km (330 miles) which corresponds to a period of 98 minutes. The orbit is expected to be inclined 97.5 degrees. *ASR* will begin a series of briefs on the various experiments on UoSAT in an upcoming issue. In addition, a major article on the UoSAT Magnetometer Experiment by its designer, Dr. Mario Acunda, LU9HBG/W3, will appear in an upcoming issue of *ORBIT* Magazine. Stay tuned!

In a related development, preparations are being made to provide ALINS (AMSAT Launch Information Network/Service) coverage of the 15 Sept. launch of UoSAT. AMSAT officials confirmed 20 July that plans are being formulated to provide real-time coverage of the UoSAT launch in a manner similar to that accomplished recently for the European Space Agency's launch of Ariane LO3 19 June 81. Preliminary estimates are that a three or four station Amateur Radio network will be configured for the launch, these officials added, to provide coverage to as wide an area as possible. Amateurs around the world should be able to monitor the progress of the launch by tuning to one of the net frequencies on the hf bands. ALINS has previously established similar efforts for Ariane LO1 (24 Dec. 79), LO2 (23 May 80) and LO3 (19 June 81). *ASR* will announce times and frequencies as well as the participating network hf stations as soon as such details are available from AMSAT HQ.

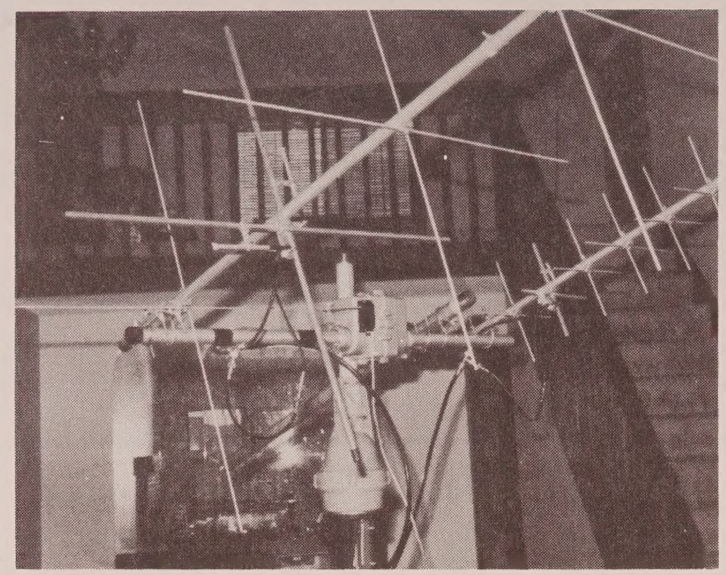
## Kick Motor Demo Firing At Marburg

Dick Daniels, W4PUJ, returned to the U.S. on July 17 after spending the week with the engineers and scientists of AMSAT-DL at their lab in Marburg. Dick's trip was designed to help in engineering the interface between the flight spaceframe and the new liquid fuel kick motor. While at Marburg he took many interesting photographs and was fortunate to witness the live firing test of a "small brother" motor at the lab. Dick reports that the 10 Newton* thruster manufactured by MBB (Messerschmitt-Boelkow-Blohm G.M.B.H.) was barely the size of a sewing thimble but, when fired, yielded a screaching sound at the limits of audible pain. One pundit remarked offhandedly that had the test of the Phase IIIB kick motor been made under similar circumstances (which were admittedly sub-optimal for this exercise), the sound of the larger motor might have been the last thing any of the engineers ever heard! Nevertheless the demonstration of the smaller 10 Newton thruster went well. A dramatic demonstration transpired when Dr. Karl Meinzer, DJ4ZC, AMSAT DL President, responded to an invitation from the MBB engineer to touch the side of the nozzle during the firing. Dick reports that Karl responded (apparently) without hesitation and remarked to the assembled witnesses that it was actually quite cold. Amazing! The larger version of the MBB motor will be used on Phase IIIB to move the spacecraft from geosynchronous parking orbit (transfer ellipse) to its final orbit which, it is hoped, will be a close approximation of the Molniya-type. (See *ASR* #4 April 6, 1981).

*10 Newtons is the force exerted on your hand by a weight of about 2¼ pounds or just over a kilogram.




**ARRL Foundation member George DuPont, WA1SVY, presents a check for $56,115 to AMSAT President Tom Clark, W3IWI. Also in the photo taken July 8 in front of the lab at Goddard are Hugh Turnbull, W3ABC, ARRL Atlantic Division Vice Director (left) and Jan King, W3GEY, AMSAT Vice President/Engineering (right). (See story in *ASR* #11)**



## OSCAR From Your Living Room?

One of the noteworthy advantages of amateur satellite operations is the ability to use small, unobtrusive antennas—but Dave Cowdin WDØHHU of Littleton, Co may be taking that philosopy to the limit!

Dave receives good signal reports from the az-el mounted Yagi array shown set up for OSCAR Mode B. He hopes others who live in areas with anti-antenna zoning laws will try the indoor approach. Tracking the satellites has not been a problem, except for one pass that sent the antenna crashing into a nearby wall! To please the XYL, one could always paint the rotor housing to match the decor! No wallpaper though, please.

## Long Haul on AMSAT-OSCAR 8

A very long-range contact on AO-8 took place this past week, reports Bud, W6CG. Bud reports that YJ8DX in New Hebrides worked KH6P/KH2 on Guam. This is a long way indeed with YJ8DX at 17.7° S, 191° W and KH6P/KH2 at 21.7° N, 167.8° W. Using suitable AO-8 locator overlays shows this to be a QSO right at the optical limits, i.e., if you were on AO-8, the QTHs of the two stations would be right on the border of visibility (horizon). As is well known, satellite QSOs are often extended by a few degrees (and minutes) by a combination of scattering and ducting modes. This maximum range QSO is nevertheless noteworthy for the fact that the two islands from which it took place are spaced very nearly at the maximum straight line (optical) distance.

## Area Coordinator Update

Operations Vice President, K1HTV, recently announced the appointment of several new area and regional coordinators. The new AMSAT officials are: Rick Dittmer, WH6AMX for the South Pacific Region; Jim Smith, KA7APJ, as Assistant Area Coordinator for Washington (State of) and Acting Area Coordinator for Alaska; and Carlos Huertas, LU4ENQ, as Coordinator for Eastern Argentina including Buenos Aires. Congratulations to all the new appointees.

## Canadians Claim Satellite Precedent

In what is being called a "first" for Amateur Radio, two Canadian Amateurs have successfully exchanged digital, packetized data using a combination of Amateur vhf links with an experimental shf transponder aboard a Canadian Government geosynchronous communications satellite. According to Larry Kayser, an AMSAT-OSCAR pioneer who built (among other things) the 70 cm beacon for AO-7, the circuit connected a station in Ottawa, Ontario with one in Vancouver, British Columbia this past July 7.

On the Ottawa end was Hugh Pett, VE3FLL, who communicated to an Anik-B ground terminal with his 1¼ meter link to a digi-peater at the Anik-B site. On the Vancouver end, Doug Lockhart, VE7APU interfaced a similar Anik-B site using his 2-meter digital link.

The long-haul transmission was carried by the Anik-B spacecraft in an experiment coordinated with the Communications Research Council of the Canadian Department of Communications. Anik-B is a government-owned, commercially built, geosynchronous satellite with two transponders aboard. The normal C-band transponder (4-6 GHz) serves much of Canada with TV, telephone and other commercial communications service. The Ku-band transponder (12-14 GHz) is designated for experimental use and has been used since 1976 for experiments with small ground station terminal antennas. Anik-B was built for Telesat Canada by Hughes/RCA and is a typically large spacecraft weighing in at about 2,000 pounds. It was placed in its geosynchronous orbit by a NASA Delta launch vehicle.

The demonstration marks an important milestone in Amateur Packet Radio even though the "trunk" of the circuit was not on amateur frequencies. The 1200 bps, 4-kHz channel provided to the experimenters will allow them to optimize their protocol for high efficiency using a media with long propagation delays. Moreover, as more stations may join the locals at each end of the "trunk," the network architecture which evolves will provide a useful model with obvious utility in understanding similar communications on Phase IIIB/C.

**Retiring *ORBIT* Editor Joe Kasser, G3ZCZ, (right) accepts a plaque from President W3IWI at a gala dinner party for Joe held in the Washington, D.C. area July 12. (See *ASR* #11)**

## ASR *SPOTLIGHT ON: WØCY*

If you've tuned across 3850 on a Tuesday evening, chances are you've heard the booming signal and friendly voice of Jim McKim, WØCY. As net control, for the Mid America Section of the 75 meter AMSAT Net since its inception seven years ago, Jim is the "Voice of AMSAT" to many, and an enthusiastic voice it is!

The owner of an electronics supply firm in Salina, Kansas, Jim literally began his involvement with satellites on "day one". A local newspaper begged for his help at 3 o'clock in the morning on October, 1957 - the day Russia launched Sputnik I. Before long, WØCY (then WØMVG) was copying telemetry from the very first "bird". His enthusiasm for satellite operation has grown even stronger since!

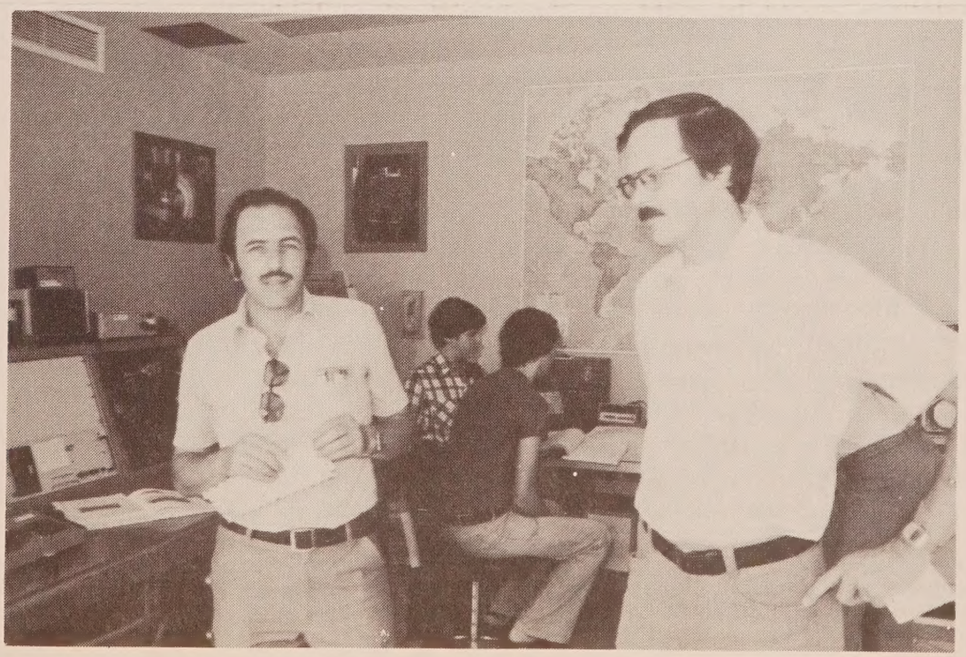
An active ham since 1933, Jim's amateur accomplishments include WAZ, DXCC (over 300 confirmed), #26 WAS on 6 meters, and Life Memberships in ARRL, AMSAT (LM #7), QCWA, and OOTC. He also holds #16 WAS via Satellite - and has the official AMSAT trophy to prove it! WØCY is a familiar call to many on OSCAR 7 modes A and B, and OSCAR 8 mode J. Jim prefers cw, but occasionally picks up the mike to chat with an old friend. Jim says Mode B is hard to beat, and as one who has copied the OSCAR satellites from OSCAR 1 on, he ought to know!

Those who have heard Jim's fine hamfest seminars remember him best for the OSCAR LOCATOR, shown below. Jim still uses the rotating globe-LED device to time OSCAR 7 operation, and the orbital model gathers lots of interest at school demonstrations and ham sessions alike. The homebrew analog computer was described in May 1974 *QST* , but stands up well against today's microcomputer equivalents.

Photo from the *Salina Journal*, June 15, 1981

The WØCY shack boasts several other unique tributes to Jim's mechanical genius. Recent projects have included a 70 cm helix-winding mandrel, a homebrew elevation rotor, and a 55 ft. rotating crankup tower, complete with a custom ground-mounted rotor! When not at the lathe, Jim can be found assembling a new portable satellite station, conducting one of the dozen-plus AMSAT demonstrations and seminars he does every year, or planning the Mid America AMSAT Forum to be held in Salina later this year.

So next time you motor down I-70 through Kansas, don't be surprised to see a rotating tower bristling with antennas popping out of the Kansas cornfields. You'll be looking at the QTH of WØCY, and if you listen closely, you'll hear Jim at work, as a craftsman at the workbench, or as a gentleman on the air. 73 to a fine OM from *ASR* and AMSAT!



**An honored guest at the AMSAT lab July 8 was David Lieberman, XE1TU, (left) who is President of AMSAT-Mexico. Rich Zwirko, K1HTV (right), AMSAT Vice President/Operations, shows Dave around the lab. (See story in *ASR* #11)**

## Geriornithopathology

**geriornithopathology** n.[‹Gr. *geras*, old age; ‹Gr. *ornis*, bird; ‹Gr. *pathos*, suffering, disease; ‹Gr. *logia*, science doctrine or theory.] The branch of the Amateur Satellite hobby dealing with old, sick birds.

This week's lesson in geriornithopathology (let's call it GOP for short!) reveals that our subject, AMSAT-OSCAR 7, though mostly comatose, is known to have lucid moments.

Recently, for example, three separate reports of observations of the 70-cm AO-7 beacon surfaced. There seems little doubt that the 70-cm beacon is functional but the overall spacecraft operability is zero (or close to it.) We have learned over the past month and a half that most, if not all, of the active electronics aboard AO-7 are functional. We have, for example, the report of W6ELT and W6CG that for a few moments they personally observed the Mode-B downlink sending their 70-cm signal back to them on 2 meters. That occurred the first week of July. During the second week in July there were three reports of the 70-cm beacon's being heard. VE3HCR, Dave Oman, of the AO-7 Ground Command Team reports that the command decoder is at least partially operative since AO-7's 70-cm beacon did in fact come on when he commanded it, much to Dave's surprise. All of the recent observation reports have in common the fact that each transmission from the bird lasted but a few seconds before fading into the noise.

These significant points are easily embraced by the current failure model put forth by AMSAT officials. The model reveals the following:

The AO-7 battery comprises 10 NiCad cells in series. In 1978 one of the cells failed. The failure mode was most unusual in that the cell in question (since having come to be called the "78" cell) failed in the open mode. Most NiCads fail, when they finally go, by shorting. As a result of the unusual open mode failure of the "78" cell, the entire battery was out of the circuit. Thus, AO-7 relied on the power generated by the solar arrays in real time rather than having the ability to store energy in the battery. So, on those occasions during early summer when AO-7 would come close to the eclipse zones during the last three years, the AO-7 operations would be disrupted. In more recent years the satellite actually powered-down during the minute or two during which it was deeply shadowed.

This year the shadow (eclipse) was darker and longer than any prior season because of the slow precession of the orbit. Consequently AO-7 experienced the sharpest drop in temperature it has faced amounting, on the surface, to perhaps 10 degrees Celsius. But the temperature of the battery (inside the spacecraft) would probably be expected to not change rapidly from loss of sunlight were it not for the fact that the cells were in poor shape to begin with. In particular, since the "78" cell was open across the entire solar array potential, it might be expected to dissipate some heat. What would happen if the fragile structure remaining in this cell were to experience a rapid temperature change due to the sudden cutoff of illumination of the solar arrays? One might conceive of a mechanism whereby one of the cell plates might warp just a bit. It might warp enough, in fact, to close the circuit in that cell which had failed in "78". Those are the essential elements of the model.

What makes this model attractive is that all of the known data can be accomodated. The reason that the 70-cm beacon comes on and then quickly fades, therefore, is best explained by the "dead battery" syndrome. The phenomenon is familiar to everyone who has tried to start a car with a dead battery. You turn on your headlights and they last a few seconds. But try to crank the engine and all you get is a grunt. The only question remaining about AO-7 is, we suspect, have we heard the last "grunt" from the old bird?

Those who want to be optimistic will be so regardless of statistics, engineering and the like. Those who wish to be realistic may ponder the likelihood that the "78" cell (or even another cell in the string) may again go open. In that case AO-7 will be back and AMSAT will have a claim to the ultimate transformation or reincarnation. Though AO-7 is referred to as a "bird", if it does perchance come back in another Karma, I suggest we begin to refer to it as a cat. Then it will be said that our *cat* was in the second of its nine lives.

**gerifelinopathology** n. [‹Gr. *geras*, old age; ‹L. *felinus*, cat; ‹Gr. *pathos*, suffering, disease; ‹Gr. *logia*, science doctrine or theory.] The branch of the Amateur Satellite hobby dealing with old, sick cats.

## New Geo-Sync on Station

India became only the fifth country to demonstrate the ability to place a communications satellite in a geo-synchronous orbit when they achieved the feat July 16. Their "Apple" experimental satellite was carried aloft by the European Space Agency's Ariane LO3 last June 19.

Apple ran into initial difficulties when controllers found they were unable to extend one of the satellite's two solar arrays. Despite attempts at deploying the second array, such as spinning the spacecraft, the faulty mechanism has prevailed, though officials in New Delhi doubted this would seriously degrade the mission.

The spacecraft is now situated over the Equator at 102° East; roughly above the island of Sumatra in Indonesia. One major accomplishment was the maneuver from the transfer ellipse to the geo-synchronous orbit which apparently went without incident. Apple was designed and developed entirely by Indian scientists who were delighted by the favorable outcome.

The design life of Apple, according to Indian Space Officials, is one year during which a host of experiments is planned.

***AMSAT Satellite Report*** *is published and mailed First Class bi-weekly by The Radio Amateur Satellite Corporation, P.O. Box 27; Washington, DC 20044 for the purpose of enhancing communications about the Amateur Radio Satellite Program. Subscription rate is $18.00 ($26.00 overseas) yearly by check or money order to "Satellite Report," 221 Long Swamp Road, Wolcott, CT 06716. Information published herein may be quoted without permission provided credit is given.*